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II. *An Account of some Experiments, touching the Electricity and Light producible on the Attrition of several Bodies.* By Mr. Fr. Hauksbee, F. R. S.

According to the Commands of the *Society*, I have made the following Experiments.

I caus'd a piece of Wood to be turn'd into the form of a short Cylinder, it being about four Inches Diameter, and three in length. This being fixt on an Axis, I melted in a Ladle about a Pound and half of the best Sealing-Wax I could procure, and when it was fluid, I plung'd the Wooden Cylinder into it, where I kept it moving round till it had got a Coat of it about half an Inch thick on its Surface, (I mean that part of it which is most remote from its Axis :) when it was perfectly cold, I plac'd it on the Machine, which gave Motion to it by a large Wheel (as usual in the Experiments on the Attrition of the Globe Glafs ;) after the Motion and Attrition had been continu'd some small time, I held the Hoop of Threads over the Cylinder, which were attracted and directed towards its Center, as in the like Experiment made with the Globe Glafs. The Threads likewise, while they remain'd directed, would fly the Approach of a Finger. Thus in all Respects relating to Electricity, the *Effluvia* of Wax seems very agreeable to those producible on the Attrition of Glafs : For on rubbing a Stick of the same premention'd Wax, the Leaf Brass would be attracted, and return'd with great Velocity ;

and sometimes a Piece of the same Brass might be carried all about a Room, seemingly riding or floating on the Surface of its *Effluvia*. In short, I find no difference in the Laws of the different *Effluvia*, tho' those of Glass seem to be much the strongest, and to act with the greatest Vigour. Thus far the Day-light Experiments.

Upon the Approach of Night, I caused the same Motion to be given to the Wax Cylinder (begging leave to call it so) as I had done in the Day time, to see what Light might then be produc'd on the Attrition of it. I apply'd some clean new Flannel on it, but could discover little or no Light; yet afterwards upon holding my naked hand, as usual, on the Glass Globe, a considerable Light was visible, tho' only where the Attrition was made, nor would it live any longer than the Motion. I try'd if a Light would be communicated to one's Finger approacht near it, (as in the Experiment of the premention'd Glass,) but could obtain no such Appearance without touching it. This in a great measure bespeaks the Weakness of its *Effluvia*. I likewise have try'd what Light might be produc'd from it, by giving Motion to it in *Vacuo*; and altho I was forc'd to use Flannel there, yet a very distinguishing Light appear'd on each Arm of the Brass Spring that gently embrac'd it; and doubt not, but if my Hand could be made use of to rub the Wax in such a Medium, the Light would have been much greater: For the Light produc'd upon the Attrition of the Flannel on the Wax in *Vacuo*, was rather better than that which was produc'd upon the Attrition of it with my naked Hand in common Air.

From all which Experiments it appears to me, that the largeness or littleness of Light or Attraction, producible from Bodies by Attrition, proceeds from the Number and Strength of their Respective *Effluvia*, and so of all Bodies reciprocally falling under the same Classis,

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Now whether these several *Phænomena* are attributable to the Quality of the *Lac*, or *Vermillion*, (which I take to be the sole Compound of the Wax;) or, whether the Mixtion of both these Bodies is absolutely necessary in the Production of these Appearances, is worthy Enquiry.

A Continuation of these Experiments.

I have farther pursu'd the Experiments on the Electricity of different Bodies in the following manner.

I caus'd two Wooden Cylinders to be Turn'd, of the same Dimensions as mentioned in the Experiment of the Sealing-Wax; and in the same manner as in that, I coat'd their outward Surfaces, one with melted Sulphur, the other with Colophony or Rosin mixt with Brick-dust, (which was put into it on purpose to bind and make it more hard; and first the Cylinder, which was cloath'd with the melted Flowers of Sulphur, I fixt to give Motion to it as usual in Experiments of this kind; and after my Hand had been held on't a little while, I caus'd the Motion to be stopt, then bringing near it the Hoop with Threads, mention'd in former Experiments, the Threads were attracted and directed to its Center, but nothing so strongly as to the Sealing-Wax. And this upon several Tryals was much the same. Then I try'd the Rosin in the same manner, and found the Electrical Quality in that much stronger than the former: For the Threads were driven towards its Center, seemingly with greater Vigour than that of the Sealing-Wax; but the Rosin at that time was not quite cold from its being melted. In both these Experiments the Threads would fly the Approach of one's Finger; but if Sealing-Wax or Amber were held near them, they would very eagerly fly and adhere

adhere to them without being rubb'd ; and that is what I never took notice of before. I farther observed, that the Rosin, while warm, would attract Leaf-Brafs at an Inch or two distance without any Attrition. But next day when I came to repeat the Experiment, its Electricity was so inconsiderable, as well as that of the Sulphur, that I did not think them worthy to trouble the Society with the sight of 'em, altho the knowledge of their Performances may not be altogether unnecessary. At Night I try'd what Light these Bodies would afford on their Attrition in the Dark, but could produce none from the Rosin, nor indeed but very little from the Sulphur, and that not by my Hand, but by holding the ends of my Nails very hard on it while it was in motion. I try'd likewise whether the Sulphur would emit any Light by its Attrition in the Dark in *Vacuo*, but could discover none altho diligently endeavour'd.

The most surprising of all Experiments that I have met with yet, are the following.

I took my Glass Globe that I use for shewing the Experiment of the included Threads, which would point every way from the Center to the Circumference upon the Attrition of it ; and in that state a Motion might be given those Threads, by the Approach of one's Hand near its outside. But this proceeded from the *Effluvia* of its own Body exerted by rubbing, therefore not so much to be wondred at. But that those Threads contain'd in the same Globe, should have motion given them by the *Effluvia* of an Heterogenous Body separate from it, and the Globe at the same time to have no manner of motion or Attrition given it, is very amasing ; and that it is so, is matter of fact. For when I held rubb'd Sealing Wax near the outside of the Globe, the Threads within would have motion given them in a very astonishing manner, altho' the Body of Wax touch'd not the Glass by 3 or 4 Inches. The like I found might be perform'd

form'd by a rubb'd Glass Tube, or by Amber ; and if the Threads were plac'd in a Bottle well cork'd up, or any other close Glass, I suppose it would answer the same. This Discovery was made this day, being the 23d of June, 1708. and I doubt not but to carry it farther than what I here now give an Account of.

P O S T S C R I P T.

I have since repeated this Experiment with Leaf-Brass cover'd with a Glass Dish on a Table, and it was observable, that (altho' the Dish was very thick) upon holding the well rubb'd Sealing Wax over it, the Pieces of Leaf-Brass within would have a brisk Motion given them, and continue so a considerable time, 'ere the Wax would require any fresh Attrition. But this Appearance will not always succeed ; for some time after endeavouring the same Experiment, I could by no means make it answer as before : The Temperature of the Air being then alter'd, its moist *Effluvia* were condens'd on the Glass ; and so long as it remain'd under such Circumstance, it was attempting it in vain. But I found, that if the Glass was a little warm'd by the Fire, or plac'd a while in the Sunshine, or well rub'd with a warm dry Linnen Cloath, any of which, whereby the Humid *Effluvia* might be evaporated, that then the included Pieces of Leaf-Brass would, from the affricated Wax, have as brisk a Motion given them as before. Now, whether the Fire, Sunshine, or the rubbing the Glass with a warm dry Linnen Cloath, not only clears it from the moist *Effluvia* condens'd on it, but likewise gives motion to the Particles of the Glass itself : Which Motion seems to produce *Effluvia*, which in conjunction with that of the Sealing-Wax, facilitates its Action on the premention'd Bodies ; and that it does
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fo, I conclude from this Particular: That when I had warm'd the Glafs by the Fire, or had evaporated the Humid *Effluvia* by any of the other means, I found I could give Motion to the included Brafs Bodies, by only rubbing my Finger on the outside of it, without the assistance of the Wax. But at such a time when the well rubb'd Wax was held over it, the Motion of those Bodies would be much encreas'd ; and 'twas observable, that sometimes the Brafs Bodies would continue to be in Motion, after the Wax was withdrawn from them. But if the Air be naturally warm, and free from Humid Vapours, there needs none of the prementioned means to assist the *Effluvia* of the Wax to give Motion to the included Brafs Bodies : Yet at the same time I must believe, that the Particles of the Glafs are then in a greater Motion, than when the Experiment will not succeed. And 'tis very probable I had never discovered this odd *Phenomenon*, had I first attempted it at an improper Temperature of the Air ; which will caution me another time in Experiments of this Nature, not to conclude till I have had recourse to such helps as just now related. What farther I have to take notice of is, that the *Effluvia* of the Wax may very sensibly be felt on the Back of the Hand, the Wax being mov'd to and fro near it, as I have formerly taken notice of the like sensible Stroaks given by the *Effluvia* of Glafs.